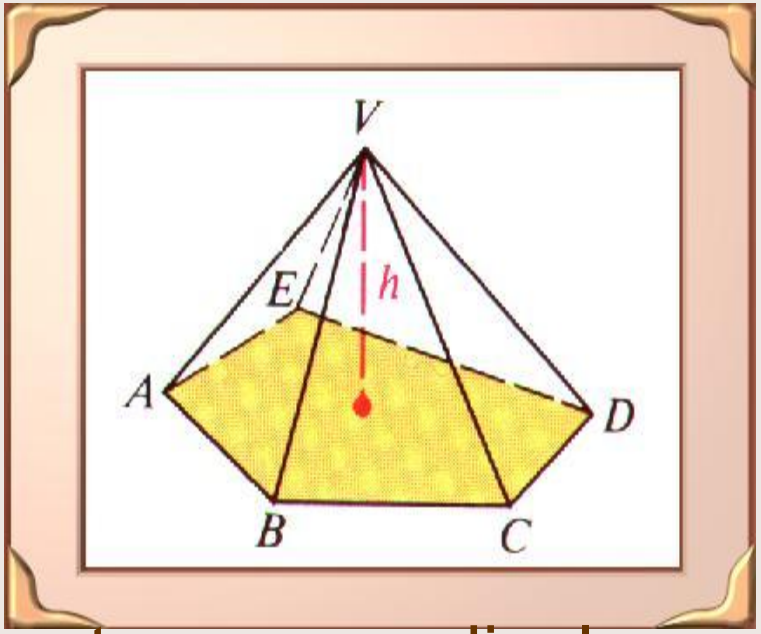
Pyramids

- The diagram shows the pentagonal pyramid *V-ABCDE.* Point V is the vertex of the pyramid and pentagon *ABCDE* is the base.



- The segment from the vertex perpendicular to the base is the altitude and its length is the *height, h,* of the pyramid.

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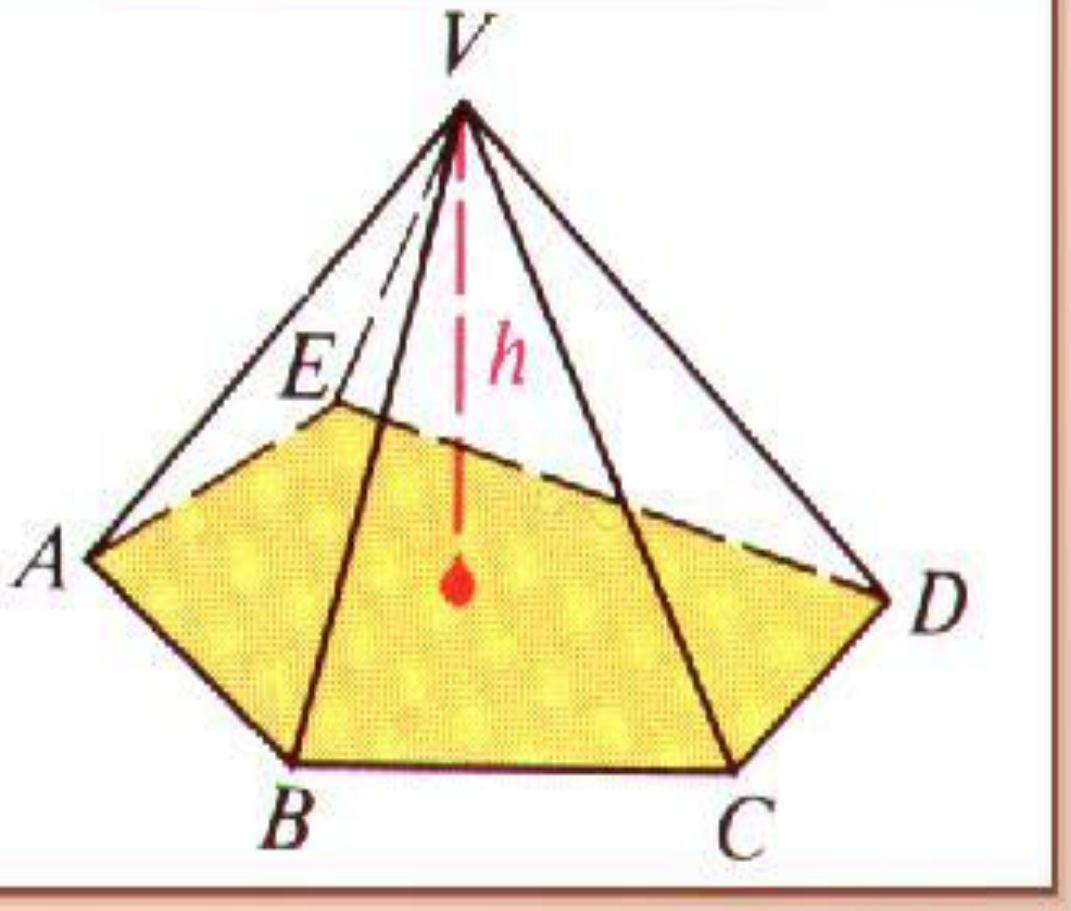

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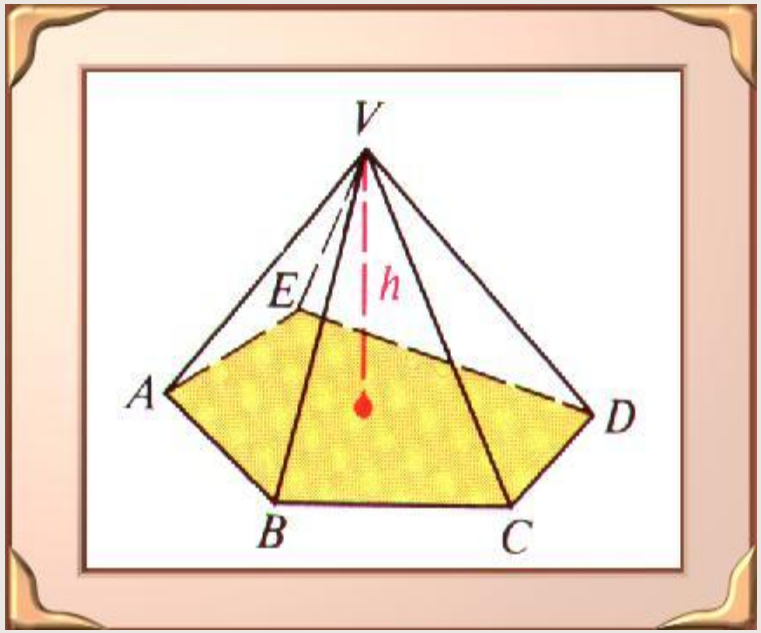
Pyramids

- The five triangular faces with *V* in common, such as ΔVAB, are lateral faces. These faces intersect in segments called **lateral edges**.



- The height of a lateral face is called the slant height, *l* of the pyramid.

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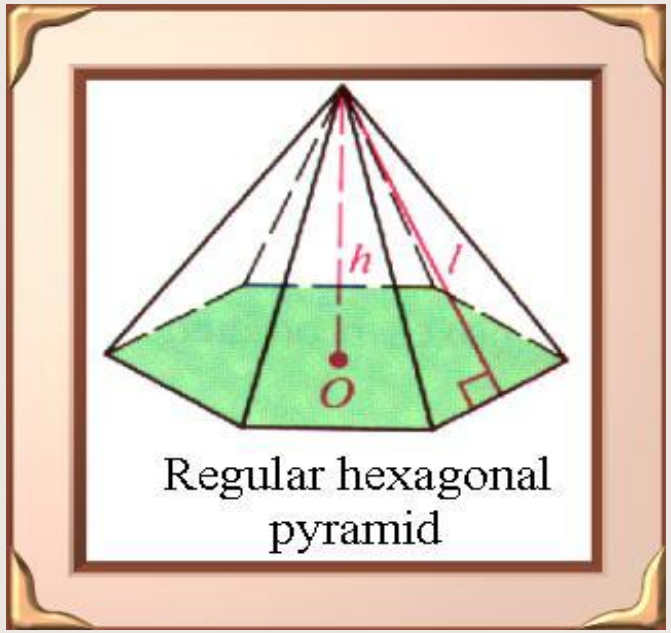
Most of the pyramids you'll study will be regular pyramids.

These are pyramids with the following properties:

- The base is a regular polygon
- All lateral edges are congruent
- All lateral faces are congruent isosceles triangles.
- The altitude meets the base at its center, *O*.



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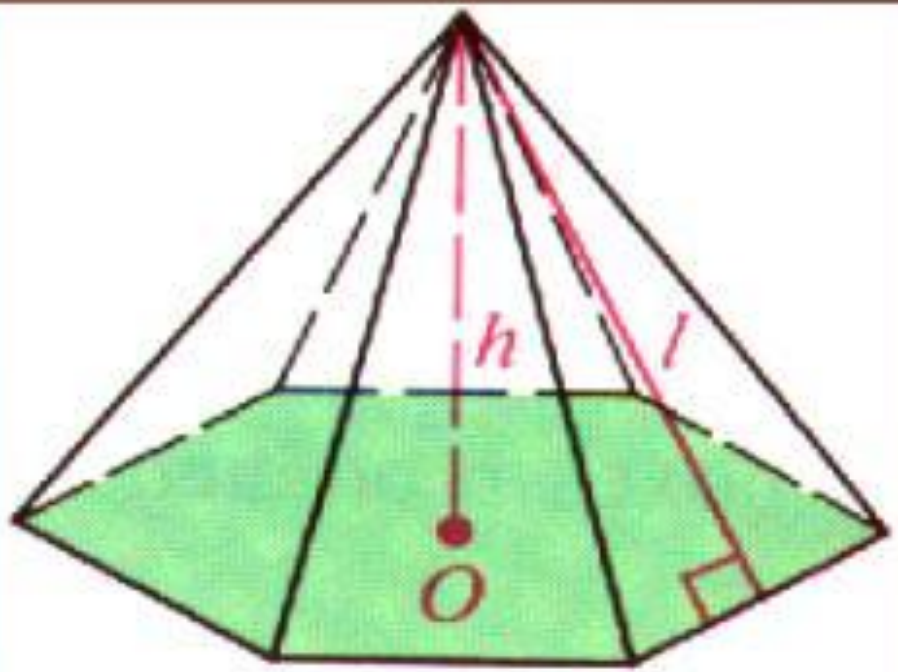

Regular hexagonal pyramid

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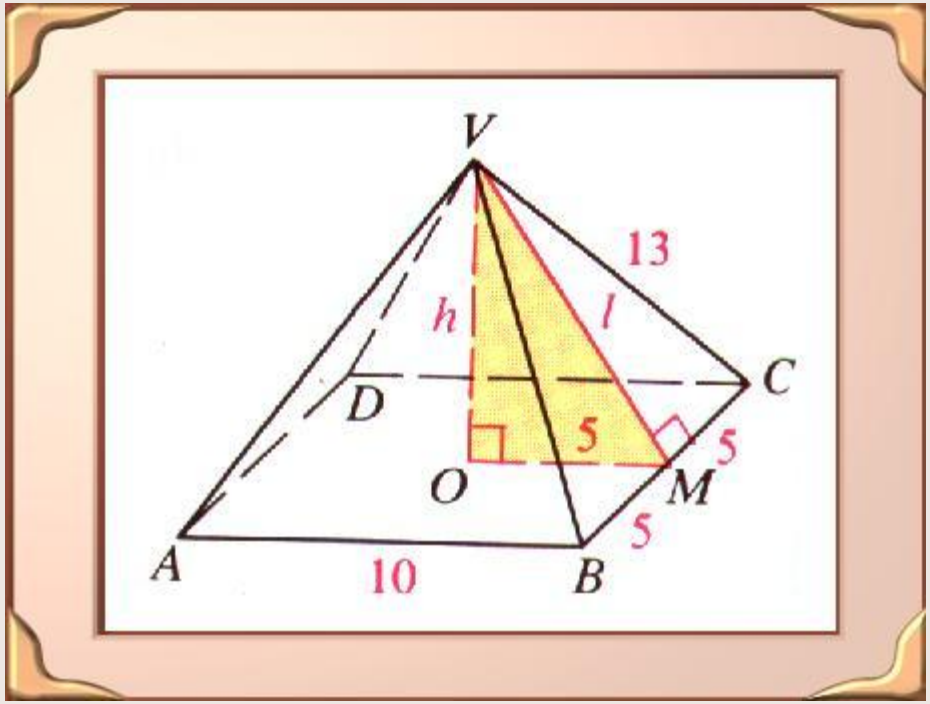
Example 1

A regular square pyramid has base edges 10 and lateral edges 13. Find its

(a)slant height

(b)height.



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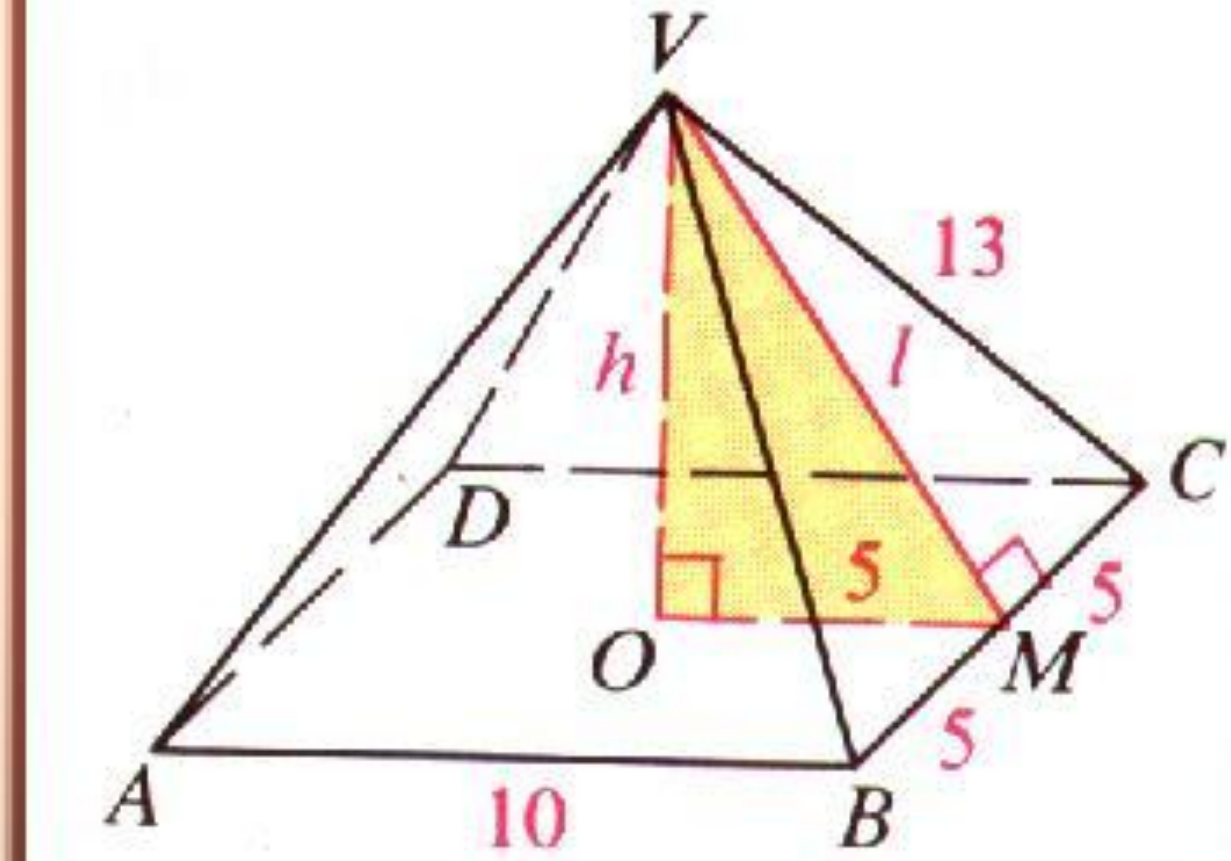

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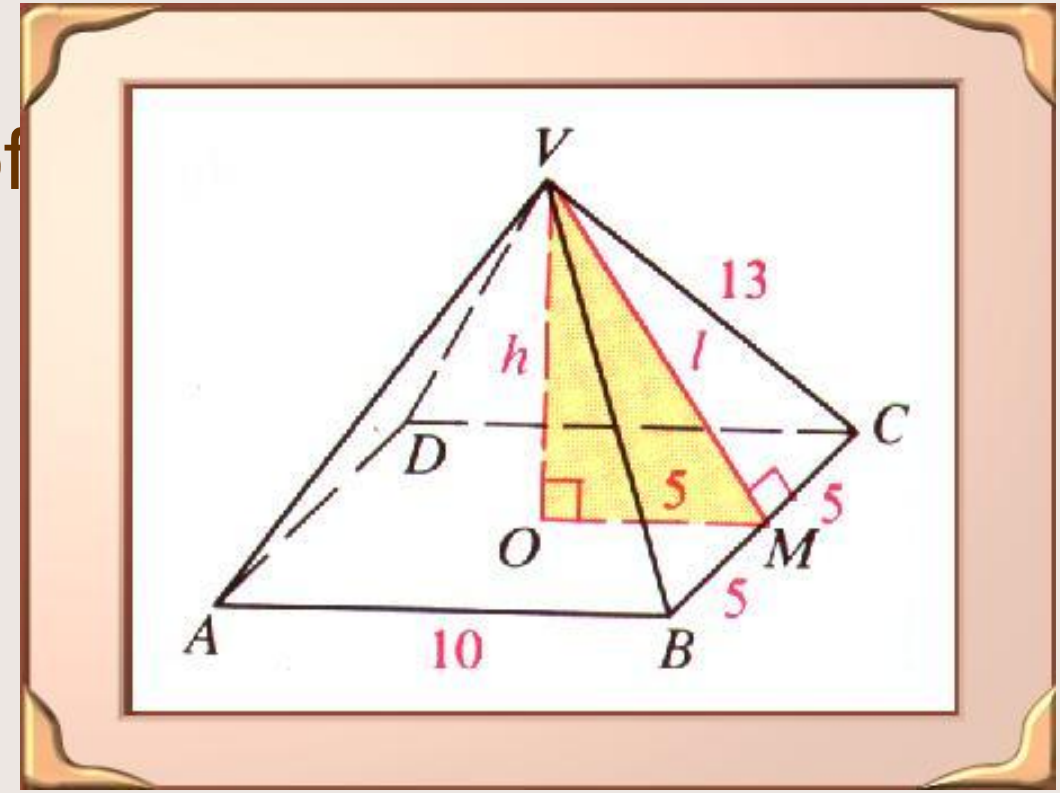
Example 2

Find the lateral area of the pyramid given in Example 1.



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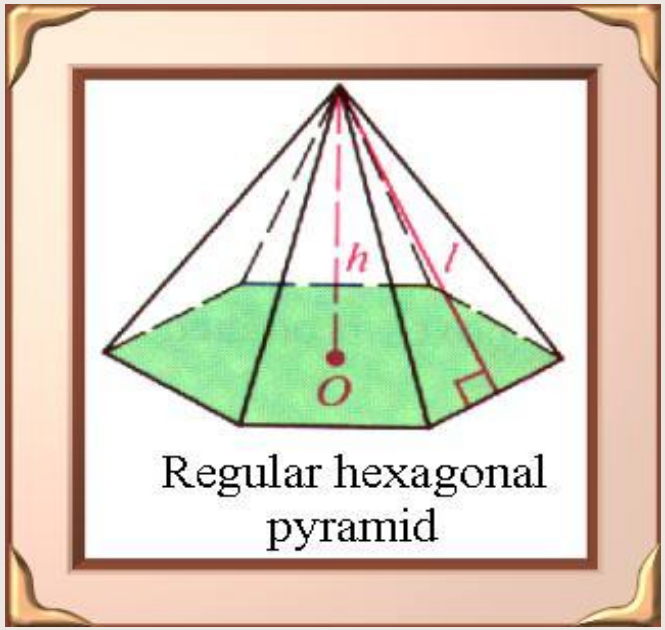
The Lateral Area of a Regular Pyramid



The lateral area of a regular pyramid with *n* lateral faces is

(the area of one lateral face x *n)*

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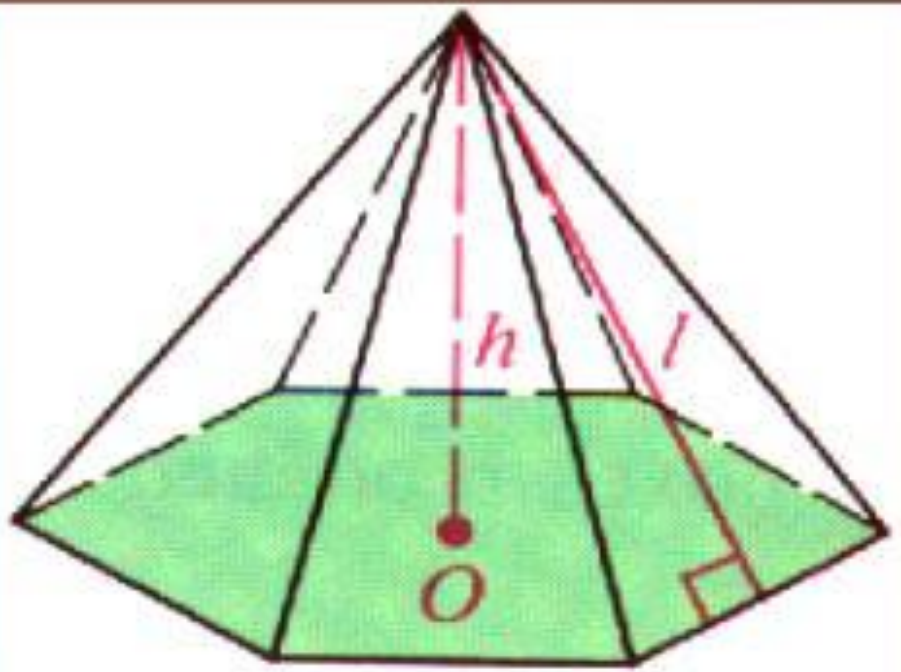

Regular hexagonal pyramid

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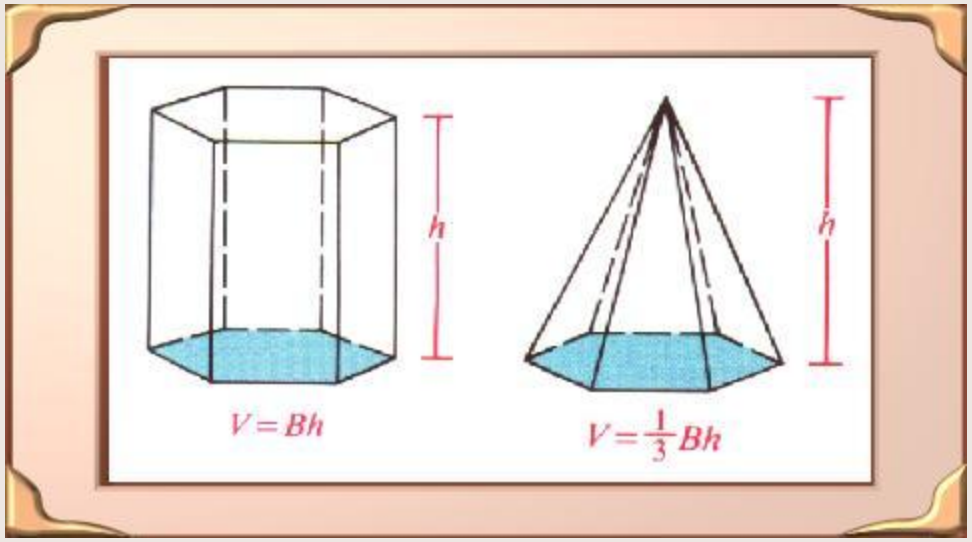
The Volume of a Pyramid

The prism and pyramid below have congruent bases and equal heights. Since the volume of the prism is *Bh*, the volume of the pyramid must be less than *Bh*. In fact, it is exactly

$$\frac{1}{3}BH.$$



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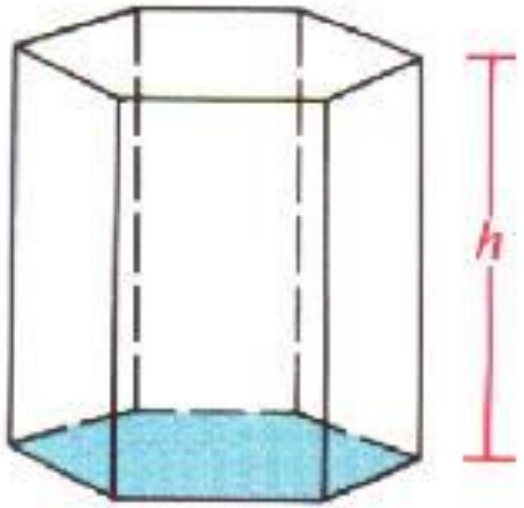

$V = Bh$

$V = \frac{1}{3}Bh$

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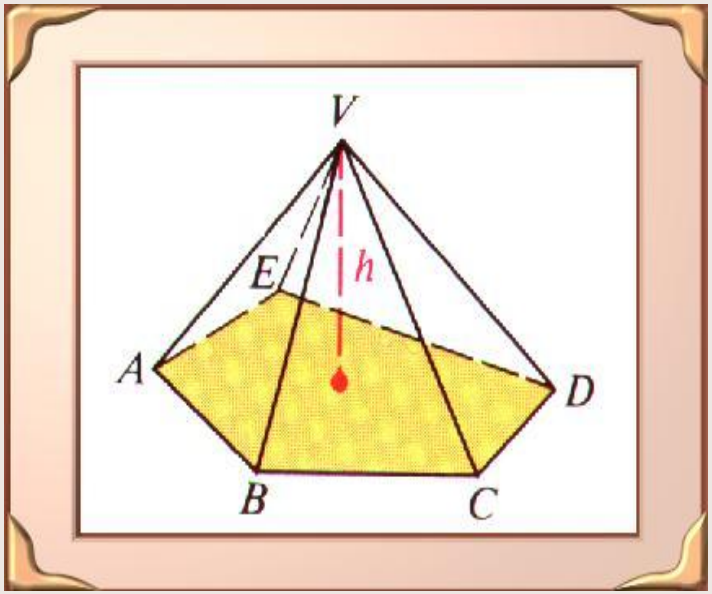
The Volume of a Pyramid

The volume of a pyramid equals *one third the area of the base* times *the height of the pyramid*.

$$V = \frac{1}{3}BH$$



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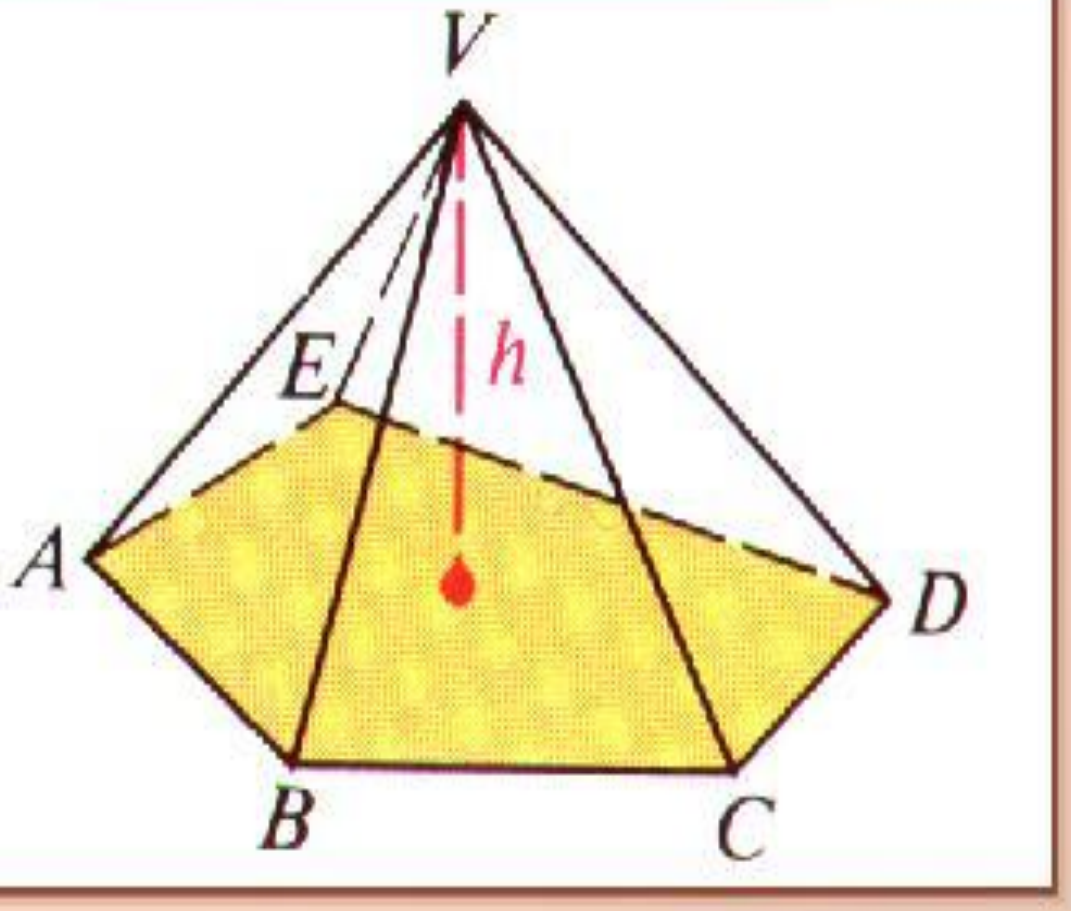

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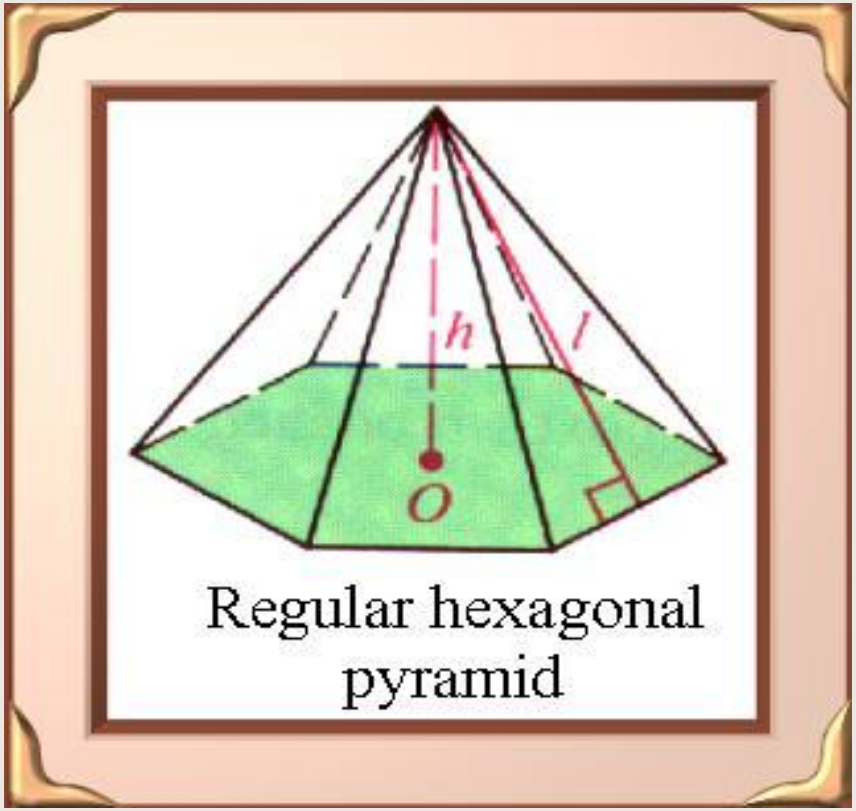
Example 3

Suppose the regular hexagonal pyramid shown has base edges 6 and height 12. Find its volume.



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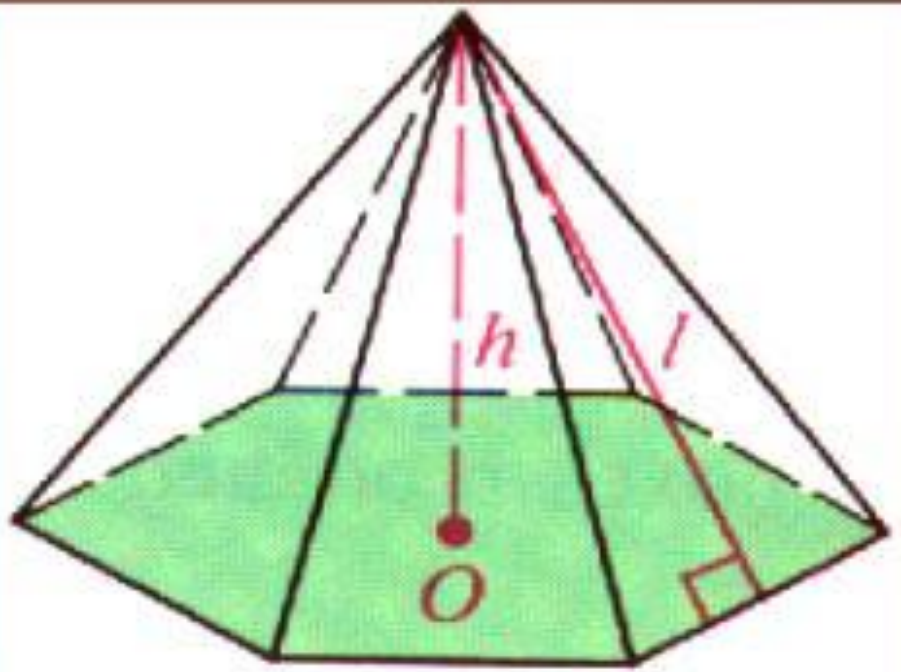

Regular hexagonal pyramid

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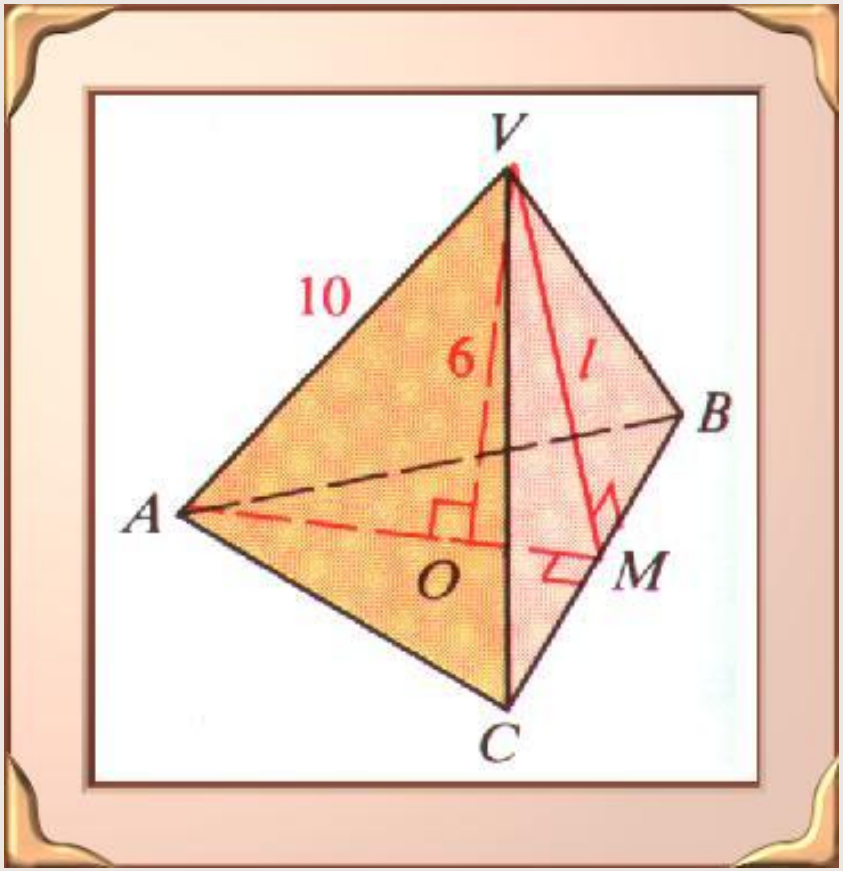
Example 4

A regular triangular pyramid has lateral edge 10 and height 6. Find the
(a) lateral area
(b) volume.



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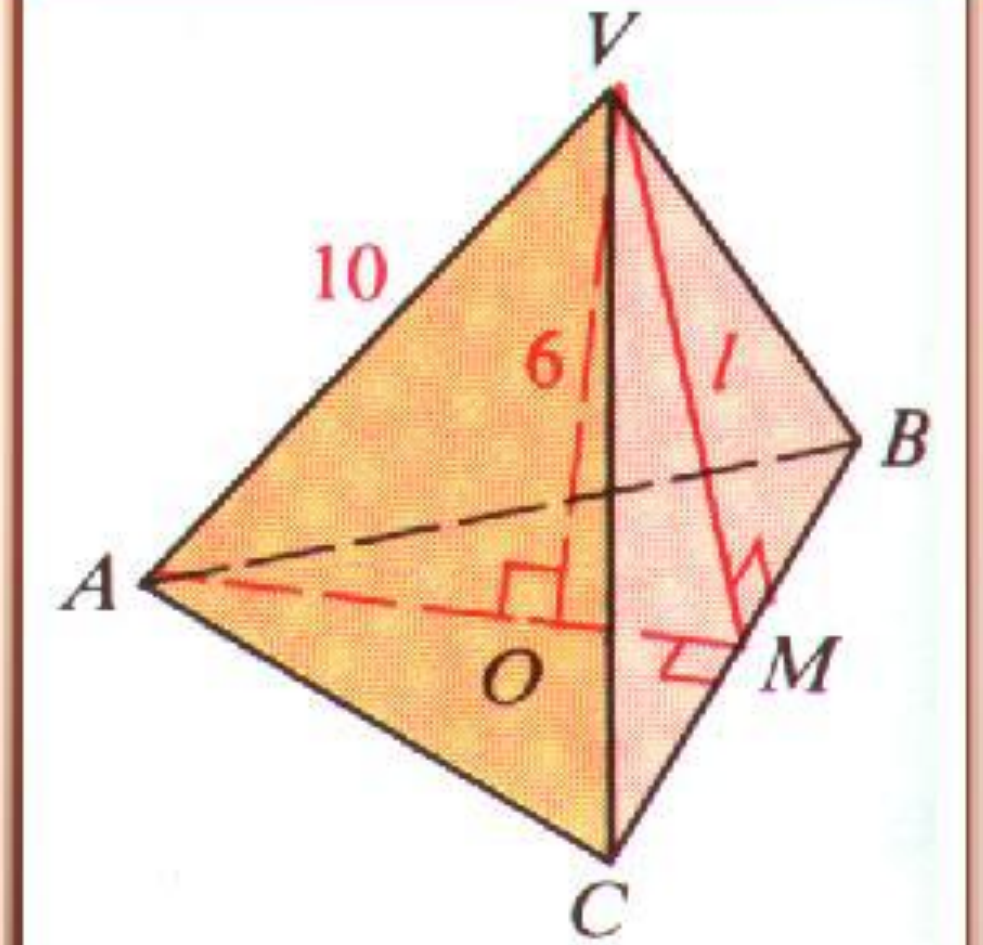

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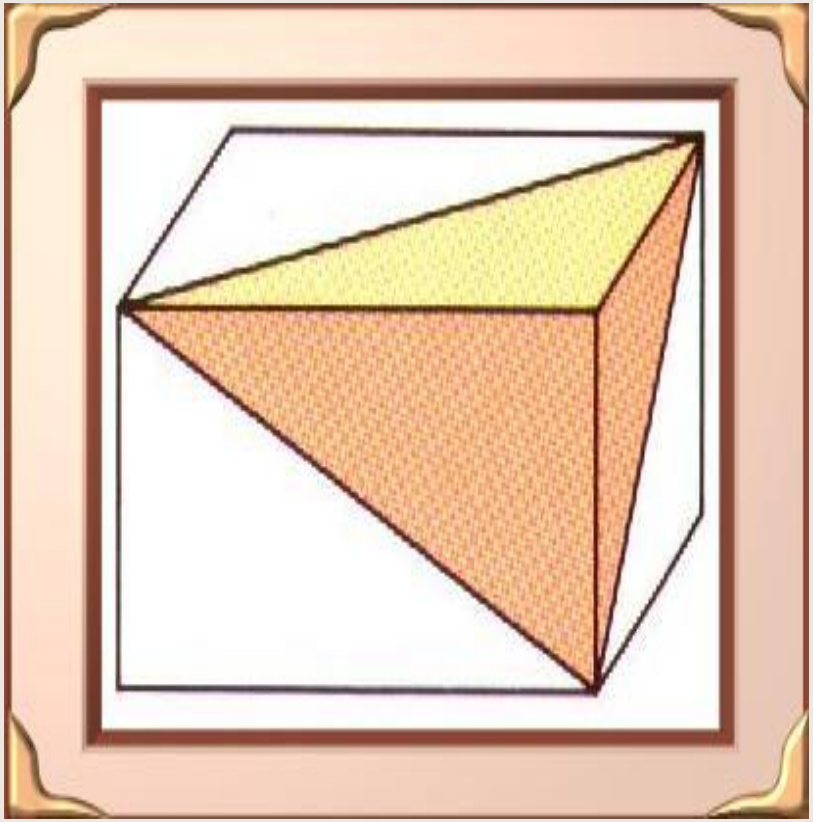
Example 5

The shaded pyramid in the diagram is cut from a rectangular solid. How does the volume of the pyramid compare with the volume of the rectangular solid?



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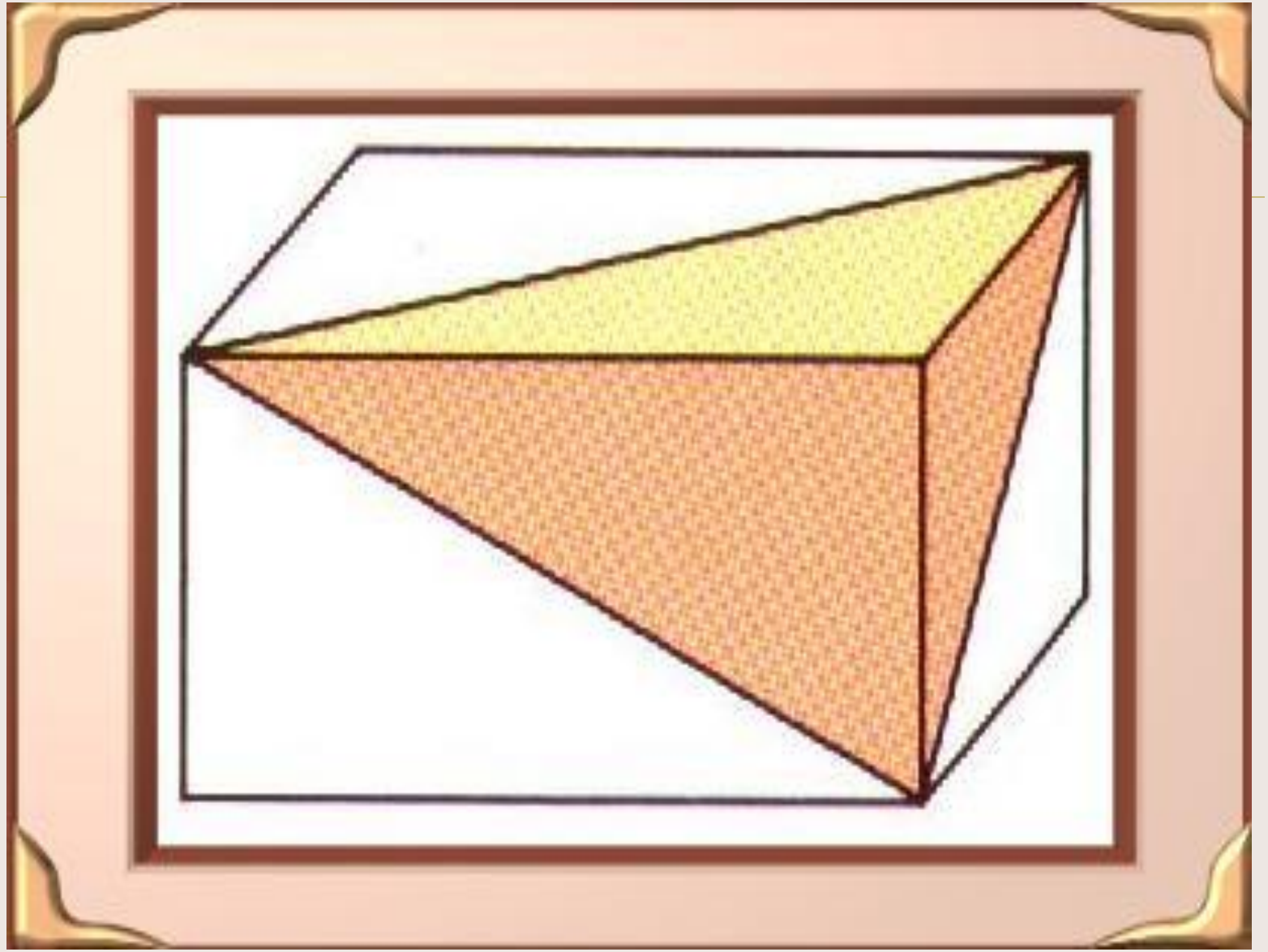

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